General

Guideline Title

Evidence-based clinical recommendations regarding fluoride intake from reconstituted infant formula and enamel fluorosis: a report of the American Dental Association Council on Scientific Affairs.

Bibliographic Source(s)

Berg J, Gerweck C, Hujoel PP, King R, Krol DM, Kumar J, Levy S, Pollick H, Whitford GM, Strock S, Aravamudhan K, Frantsve-Hawley J, Meyer DM, American Dental Association Council on Scientific Affairs Expert Panel [trunc]. Evidence-based clinical recommendations regarding fluoride intake from reconstituted infant formula and enamel fluorosis: a report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc. 2011 Jan;142(1):79-87. [53 references] PubMed

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The grades of evidence (Ia-IV) and the classification of recommendations (A-D) are defined at the end of the "Major Recommendations" field.

Recommendations of the American Dental Association Council of Scientific Affairs Expert Panel Regarding Fluoride Intake from Infant Formula

The members of the American Dental Association (ADA) expert panel encourages clinicians to follow the American Academy of Pediatrics guidelines for infant nutrition,* which advocate exclusive breastfeeding until the child is aged 6 months and continued breastfeeding until the child is at least 12 months of age, unless specifically contraindicated.

The panel offers the following suggestions to practitioners to use in advising parents and caregivers of infants who consume powdered or liquid concentrate infant formula as the main source of nutrition:

- Suggest the continued use of powdered or liquid concentrate infant formulas reconstituted with optimally fluoridated drinking water while being cognizant of the potential risk of enamel fluorosis development (strength of evidence: D).
- When the potential risk of enamel fluorosis development is a concern, suggest ready-to-feed formula or powdered or liquid concentrate formula reconstituted with water that either is fluoride free or has low concentrations of fluoride (strength of evidence: C).

* Source: Gartner LM, Morton J, Lawrence RA, et al. Breastfeeding and the use of human milk. Pediatrics 2005;115(2):496-506

Definitions:

Level	Category of Evidence
Ia	Evidence from systematic review of randomized controlled trials
Ib	Evidence from at least one randomized controlled trial
IIa	Evidence from at least one controlled study without randomization
IIb	Evidence from at least one other type of quasiexperimental study, such as time series analysis or studies in which the unit of analysis is not the individual
III	Evidence from nonexperimental descriptive studies, such as comparative studies, correlation studies, cohort studies and case-control studies
IV	Evidence from expert committee reports or opinions or clinical experience of respected authorities

Classification	Strength of Recommendations
A	Directly based on category I evidence
B	Directly based on category II evidence or extrapolated from category I evidence
C	Directly based on category III evidence or extrapolated from category I or II evidence
D	Directly based on category IV evidence or extrapolated from category I, II or III evidence

Amended with permission of the British Medical Journal (BMJ) Publishing Group from Shekelle PG, Woolf SH, Eccles M, Grimshaw J. Clinical guidelines: developing guidelines. Brit Med J 1999;318(7183):593-6.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Enamel fluorosis

Guideline Category

Counseling

Management

Risk Assessment

Clinical Specialty

Dentistry

Family Practice

Pediatrics

Intended Users

Advanced Practice Nurses

Dentists

Health Care Providers

Physician Assistants

Physicians

Public Health Departments

Guideline Objective(s)

- To determine the risk of developing enamel fluorosis as a result of ingesting fluoride from reconstituted infant formula
- To develop evidence-based clinical recommendations for the use of fluoridated water in reconstituting infant formula

Target Population

Infants from birth to 12 months who consume powdered or liquid concentrate infant formula reconstituted with water as the main source of nutrition

Interventions and Practices Considered

1. Powdered or liquid concentrate infant formulas reconstituted with optimally fluoridated drinking water
2. Ready-to-feed formula or powdered or liquid concentrate formula reconstituted with water that either is fluoride free or has low concentrations of fluoride

Major Outcomes Considered

Incidence of enamel fluorosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Searches of Unpublished Data

Description of Methods Used to Collect/Select the Evidence

Literature Search

The panel established the following inclusion and exclusion criteria to screen for relevant articles.

Inclusion Criteria

Staff members of the ADA Center for Evidence-based Dentistry (CEBD) included studies if they:

- Were published in English
- Were conducted in humans
- Involved the evaluation of the use of infant formula and dental fluorosis
- Involved the examination of children for fluorosis and included information on fluorosis prevalence as an outcome

Exclusion Criteria

CEBD staff members excluded studies if they:

- Involved evaluation of animals
- Provided information only on other fluoride exposures (for example, toothpastes and nonformula dietary sources)
- Focused on primary teeth

CEBD staff members searched MEDLINE for articles published until Sept. 9, 2008, to identify systematic reviews and current clinical studies that addressed the following clinical question: Is consumption of infant formula reconstituted with water that contains various concentrations of fluoride by infants from birth to 12 months associated with an increased risk of developing enamel fluorosis in the permanent dentition?

Systematic Reviews

The CEBD staff members limited the search to English-language articles and systematic review or meta-analysis articles and used the following search terms: "fluorosis" OR "Fluorosis, Dental" (Medical Subject Headings [MeSH] Terms) OR "mottled teeth" AND "bottlefeed*" OR "bottle feed*" OR "bottle-feed*" OR "bottlefed" OR "bottle fed" OR "bottle-fed" OR "infant formula*" OR "formula*" AND "feeding" OR "formula fed" OR "reconstituted milk" OR "infant food" OR "bottled water" OR "breastfeed*" OR "breast feed*" OR "breastfeed*" OR "breastfed" OR "breast fed" OR "nutrition physiology" OR "diet" OR "feeding behavior" OR "food analysis" OR "epidemiologic factors" OR "time factors" NOT "animals" (MeSH Terms) NOT "humans" (MeSH Terms).

The search yielded 75 articles. Two CEBD staff members independently reviewed titles and abstracts and identified 20 articles for full-text review. The same reviewers read the 20 articles and excluded all of them. For information about excluded articles along with reasons for exclusion, see Appendix 1 in the supplemental data to the online version of the original guideline document (see the "Availability of Companion Documents" field).

The panel considered the prepublication version of a systematic review previously commissioned by the CSA. This article subsequently was published in The Journal of the American Dental Association (JADA). On June 16, 2010, CEBD staff replicated the original search for literature published from Sept. 10, 2008, through that date but did not identify any additional reviews.

Clinical Studies

CEBD staff members conducted a second search to identify clinical studies published after the last search date within the systematic review. They searched for clinical studies published between Sept. 1, 2007, and Sept. 8, 2008. Their initial search yielded 16 articles. Two independent reviewers reviewed titles and abstracts for relevance to the clinical question. They identified five articles for full-text review, of which they selected for inclusion one clinical study by Spencer and Do (for information about excluded articles, see Appendix 1 in the supplemental data to the online version of the original guideline [see the "Availability of Companion Documents" field]). After reviewing this article, the panel asked the primary author of the systematic review, who also was a member of the expert panel, to incorporate this study into the analyses performed for the systematic review and generate an updated summary estimate. (For information on the update to the systematic review, see Appendix 2 of the original guideline [see the "Availability of Companion Documents" field].) During the panel meeting, one panel member also presented additional data from the Iowa Fluoride Study (IFS) for the panel's consideration. An article containing these additional data from the IFS recently was published in JADA. CEBD staff members updated the search on June 16, 2010, searching for relevant articles published after Sept. 9, 2008, and found 40 studies but selected none for inclusion.

Number of Source Documents

Center for Evidence-based Dentistry (CEBD) staff identified one systematic review and two clinical studies. The panel reviewed this evidence to develop recommendations.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Level	Category of Evidence
Ia	Evidence from systematic review of randomized controlled trials
Ib	Evidence from at least one randomized controlled trial
IIa	Evidence from at least one controlled study without randomization
IIb	Evidence from at least one other type of quasiexperimental study, such as time series analysis or studies in which the unit of analysis is not the individual
III	Evidence from nonexperimental descriptive studies, such as comparative studies, correlation studies, cohort studies and case-control studies
IV	Evidence from expert committee reports or opinions or clinical experience of respected authorities

Amended with permission of the British Medical Journal (BMJ) Publishing Group from Shekelle PG, Woolf SH, Eccles M, Grimshaw J. Clinical guidelines: developing guidelines. Brit Med J 1999;318(7183):593-6.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Critical Appraisal

The panel performed a qualitative assessment of the strengths and limitations of each study to determine the quality of the evidence (for information about the individual studies, see Appendix 2 of the supplemental data to the online version of the original guideline document [see the "Availability of Companion Documents" field).

Grading the Evidence

On the basis of the included studies, the panel developed evidence statements and graded them according to a system developed by Shekelle and colleagues (see the "Rating Scheme for the Strength of the Evidence" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Consensus Development Conference)

Description of Methods Used to Formulate the Recommendations

The American Dental Association (ADA) Council on Scientific Affairs (CSA) convened a panel to evaluate the available scientific evidence on the topic of fluoride intake from infant formula and any association with fluorosis.

The Council selected panelists on the basis of their expertise in the relevant subject matter. At workshops held at ADA Headquarters November 10-12, 2008, and July 20-22, 2009, and in subsequent conference calls and e-mail communications, the panel evaluated the published evidence and developed evidence-based clinical recommendations for the use of fluoridated water in reconstituting infant formula.

Classifying the Strength of the Clinical Recommendations

The panel developed clinical recommendations on the basis of its interpretation of this evidence. The panelists classified clinical recommendations according to the strength of the evidence that forms the basis for the recommendation, again using a system modified from that of Shekelle and colleagues (see the "Rating Scheme for the Strength of the Recommendations" field). The classification of the recommendation directly reflects the level of scientific evidence that supports the recommendation.

Process for Developing Clinical Recommendations

When the panel members were unable to reach a consensus in interpreting evidence into clinically relevant recommendations, they used a majority vote to make final determinations.

Rating Scheme for the Strength of the Recommendations

Classification	Strength of Recommendations
A	Directly based on category I evidence
B	Directly based on category II evidence or extrapolated from category I evidence
C	Directly based on category III evidence or extrapolated from category I or II evidence
D	Directly based on category IV evidence or extrapolated from category I, II or III evidence

Amended with permission of the British Medical Journal (BMJ) Publishing Group from Shekelle PG, Woolf SH, Eccles M, Grimshaw J. Clinical guidelines: developing guidelines. Brit Med J 1999;318(7183):593-6.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The panel submitted its clinical recommendations for comment to both internal and external scientific experts and organizations (for a listing of external reviewers, see Appendix 3 of the supplemental data to the online version of this guideline [see the "Availability of Companion Documents" field]). After reviewing all submitted remarks, the panel revised its recommendations where appropriate. The American Dental Association Council on Scientific Affairs approved the final clinical recommendations.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Decrease in enamel fluorosis

Potential Harms

Consumption of infant formula may be associated with an increased risk of developing enamel fluorosis in the permanent dentition

Qualifying Statements

Qualifying Statements

In this report, the authors present a critical evaluation and summary of the relevant scientific evidence that is intended to assist the clinician in the decision-making process. This report does not represent a standard of care. The clinical recommendations presented here should be integrated with the practitioner's professional judgment and the individual patient's needs and preferences.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Quick Reference Guides/Physician Guides

Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Berg J, Gerweck C, Hujoel PP, King R, Krol DM, Kumar J, Levy S, Pollick H, Whitford GM, Strock S, Aravamudhan K, Frantsve-Hawley J, Meyer DM, American Dental Association Council on Scientific Affairs Expert Panel [trunc]. Evidence-based clinical recommendations regarding fluoride intake from reconstituted infant formula and enamel fluorosis: a report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc. 2011 Jan;142(1):79-87. [53 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011 Jan

Guideline Developer(s)

American Dental Association - Professional Association

Source(s) of Funding

The Council on Scientific Affairs commissioned the panel's work, which was funded by the American Dental Association.

Guideline Committee

American Dental Association Council on Scientific Affairs Expert Panel on Fluoride Intake From Infant Formula and Fluorosis

Composition of Group That Authored the Guideline

Authors: Joel Berg, DDS; Catherine Gerweck, DMD, MS, RD; Philippe P. Hujoel, MSD, PhD; Rebecca King, DDS, MPH; David M. Krol, MD, MPH; Jayanth Kumar, DDS, MPH; Steven Levy, DDS, MPH; Howard Pollick, BDS, MPH; Gary M. Whitford, PhD, DMD; Sheila Strock, DMD, MPH; Krishna Aravamudhan, BDS, MS; Julie Frantsve-Hawley, RDH, PhD; Daniel M. Meyer, DDS

Financial Disclosures/Conflicts of Interest

The panel comprised 12 people who represented a broad range of expertise. Each panelist completed a standard conflict-of-interest questionnaire.

None of the authors reported any disclosures.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available in Portable Document Format (PDF) from the American Dental Association Web site .

Print copies: Available from the American Dental Association, 211 E. Chicago Avenue, Chicago, IL 60611

Availability of Companion Documents

The following are available:

- Evidence-based clinical recommendations regarding fluoride intake from reconstituted infant formula and enamel fluorosis. Appendices. American Dental Association Council on Scientific Affairs; 2011. 4 p. Electronic copies: Available in Portable Document Format (PDF) from the American Dental Association (ADA) Web site .
- Reconstituted Infant Formula and Enamel Fluorosis: Evidence-based Clinical Recommendations. Chairside guide. American Dental Association Council on Scientific Affairs; 2010. 2 p. Electronic copies: Available in PDF from the ADA Web site .

Patient Resources

None available

NGC Status

This summary was completed by ECRI Institute on February 15, 2013. The information was verified by the guideline developer on March 19, 2013.

Copyright Statement

Disclaimer

NGC Disclaimer